ABSTRACT OF THE DISCLOSURE

The present invention, generally speaking, provides for high-efficiency power control of a high-efficiency (e.g., hard-limiting or switch-mode) power amplifier. In one embodiment, the invention exploits the recognition that, for a constant-resistance circuit, power is equal to the square of the voltage across the circuit divided by the resistance of the circuit. In the case of certain switch mode amplifiers, such as Class E and Class F amplifiers, as well as saturated linear amplifiers, the amplifier may reasonably be regarded as having a constant resistance with varying power supply. In an exemplary embodiment, the supply voltage is controlled using a combination of two stages, a switch-mode converter stage that accomplishes gross power level control and a subsequent linear regulator stage that accomplishes more precise power envelope control, e.g., burst control. Control circuitry for the amplifier is simplified by combining control signals for power amplifier ramp-up transition, power level during a TDMA burst, and ramp-down transition, into a single control signal, and by eliminating feedback control (which also eliminates errors in the feedback control of output power due to the use of detecting diodes). Output noise from the variable output switch-mode voltage converter stage is filtered using the linear regulator stage that accomplishes burst control, further increasing circuit efficiency. Energy efficiency during ramp-up to the desired output power, during the burst at all output power levels, and during ramp-down from the transmitted power, is maximized. Reasonable expected efficiencies for the switch-mode converter stage and the linear regulator stage are 90% and 80%, respectively. A high-efficiency switch-mode amplifier may have an efficiency on the order of 80%, enabling an overall efficiency of greater than 50% to be achieved, comparing very favorably with current efficiencies of about 10%.